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(54) **METHODS FOR IDENTIFYING NETWORK TRAFFIC CHARACTERISTICS TO CORRELATE AND MANAGE ONE OR MORE SUBSEQUENT FLOWS AND DEVICES THEREOF**

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CPC ***H04L 67/22*** (2013.01); ***H04L 63/1408*** (2013.01); ***H04L 63/20*** (2013.01); ***H04L 67/02*** (2013.01); ***H04L 67/2819*** (2013.01)

(58) **Field of Classification Search**

USPC 370/235; 707/999.01; 709/223–225; 726/22, 23

See application file for complete search history.

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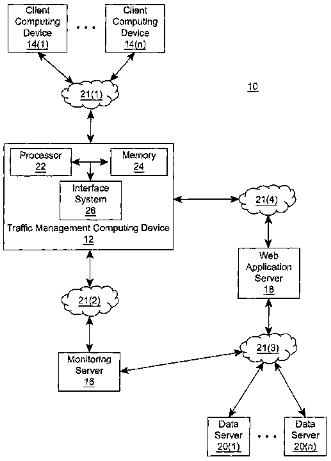
(57) **ABSTRACT**

A method, non-transitory computer readable medium, and device that identifies network traffic characteristics to correlate and manage one or more subsequent flows includes transmitting a monitoring request comprising one or more attributes extracted from an HTTP request received from a client computing device and a timestamp to a monitoring server to correlate one or more subsequent flows associated with the HTTP request. The HTTP request is transmitted to an application server after receiving an acknowledgement response to the monitoring request from the monitoring server. An HTTP response to the HTTP request is received from the application server. An operation with respect to the HTTP response is performed.

18 Claims, 5 Drawing Sheets



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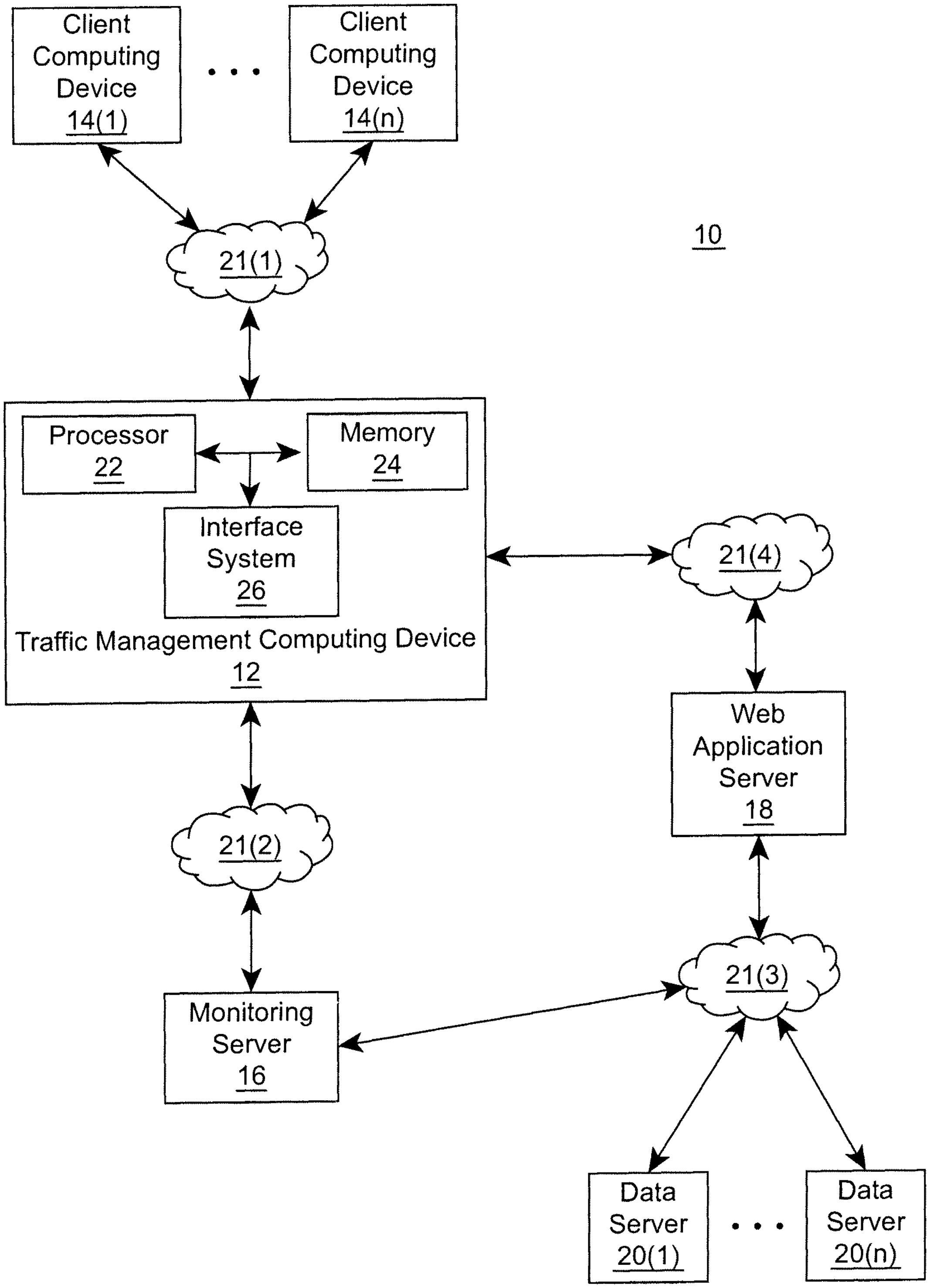
Client Computing Device 14(1)
Client Computing Device 14(n)
21(1)
10
Processor 22
Memory 24
Interface System 26
Traffic Management Computing Device 12
21(4)
Web Application Server 18
21(2)
21(3)
Monitoring Server 16
Data Server 20(1)
Data Server 20(n)

FIG. 1

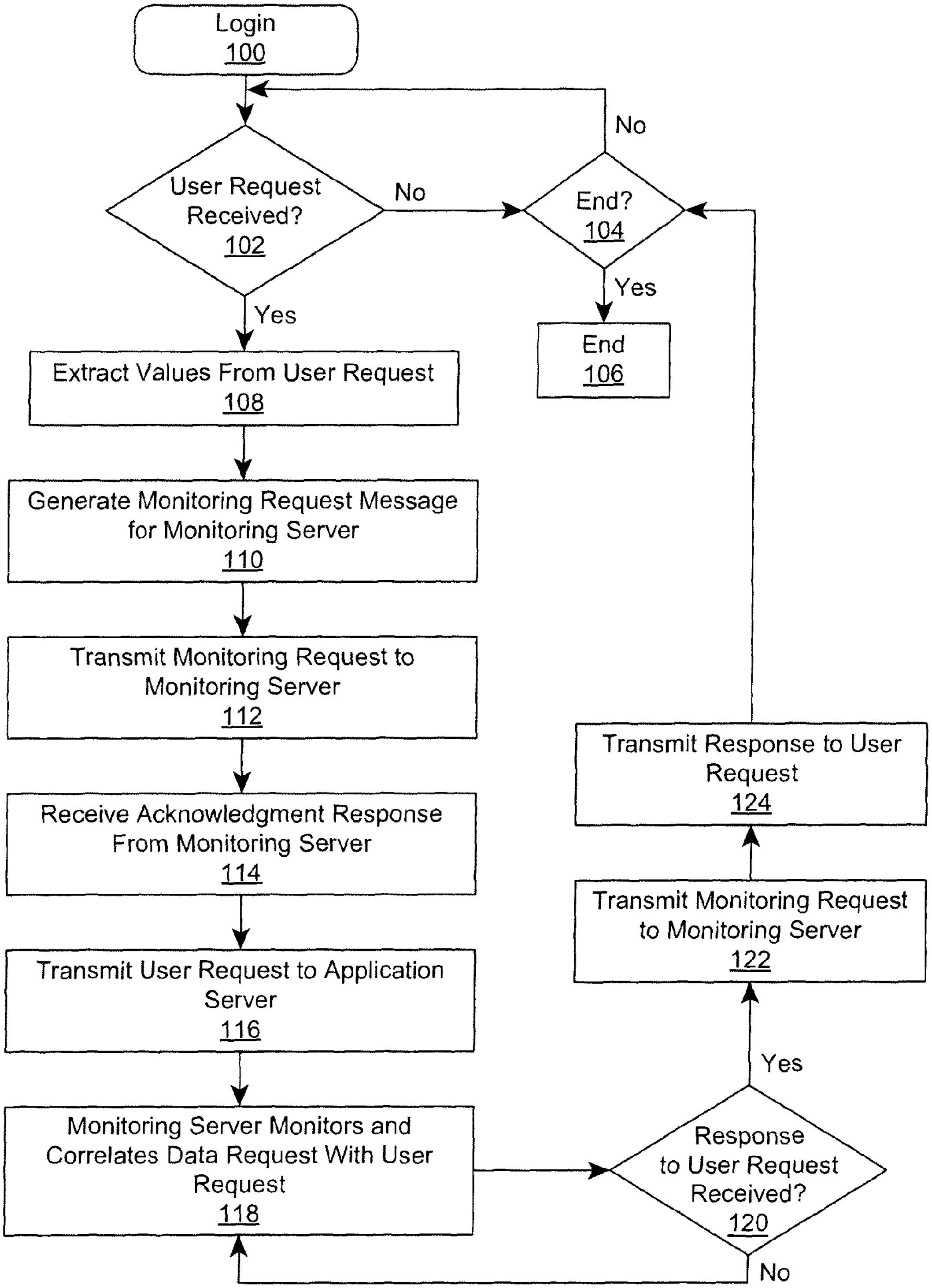
Login
100
User Request Received?
102
No
End?
104
No
Yes
End
106
Yes
Extract Values From User Request
108
Generate Monitoring Request Message for Monitoring Server
110
Transmit Monitoring Request to Monitoring Server
112
Receive Acknowledgment Response From Monitoring Server
114
Transmit User Request to Application Server
116
Monitoring Server Monitors and Correlates Data Request With User Request
118
Response to User Request Received?
120
Yes
No
Transmit Monitoring Request to Monitoring Server
122
Transmit Response to User Request
124

FIG. 2

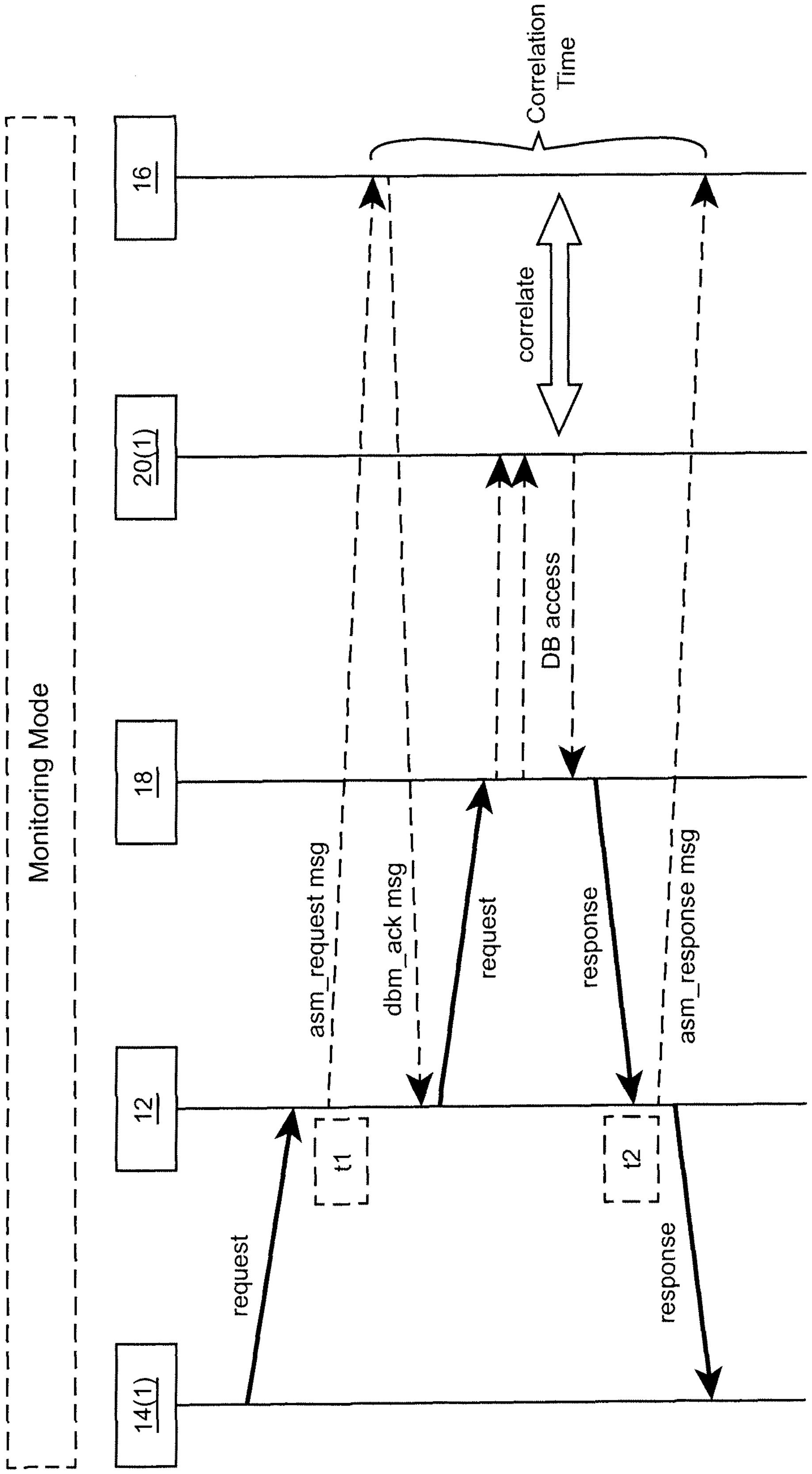
Monitoring Mode
14(1)
12
18
20(1)
16
request
t1
asm_request msg
dbm_ack msg
request
DB access
correlate
Correlation Time
response
t2
asm_response msg
response

FIG. 3

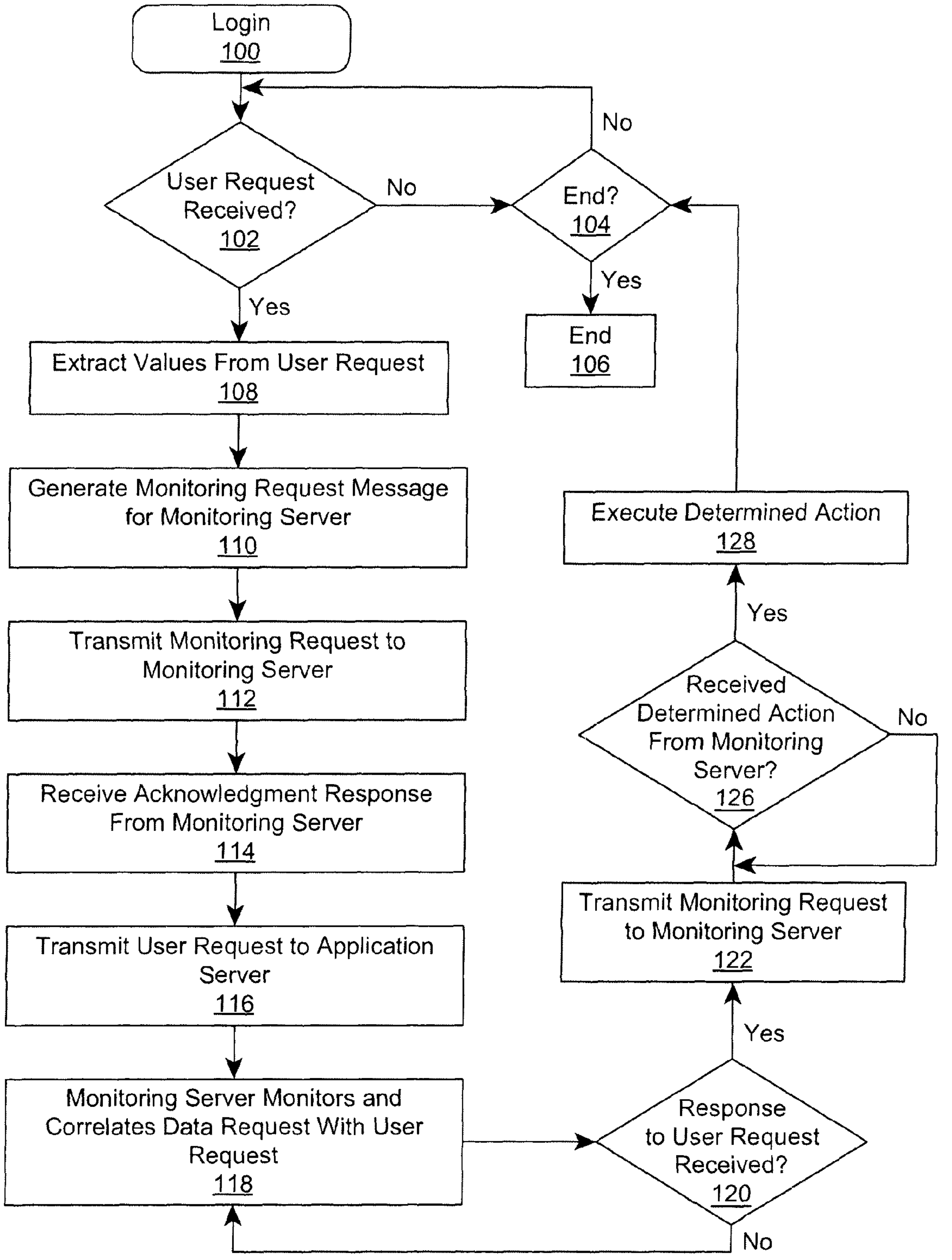
Login 100
User Request Received? 102
No
End? 104
No
Yes
End 106
Yes
Extract Values From User Request 108
Generate Monitoring Request Message for Monitoring Server 110
Transmit Monitoring Request to Monitoring Server 112
Receive Acknowledgment Response From Monitoring Server 114
Transmit User Request to Application Server 116
Monitoring Server Monitors and Correlates Data Request With User Request 118
Response to User Request Received? 120
No
Yes
Transmit Monitoring Request to Monitoring Server 122
Received Determined Action From Monitoring Server? 126
No
Yes
Execute Determined Action 128

FIG. 4

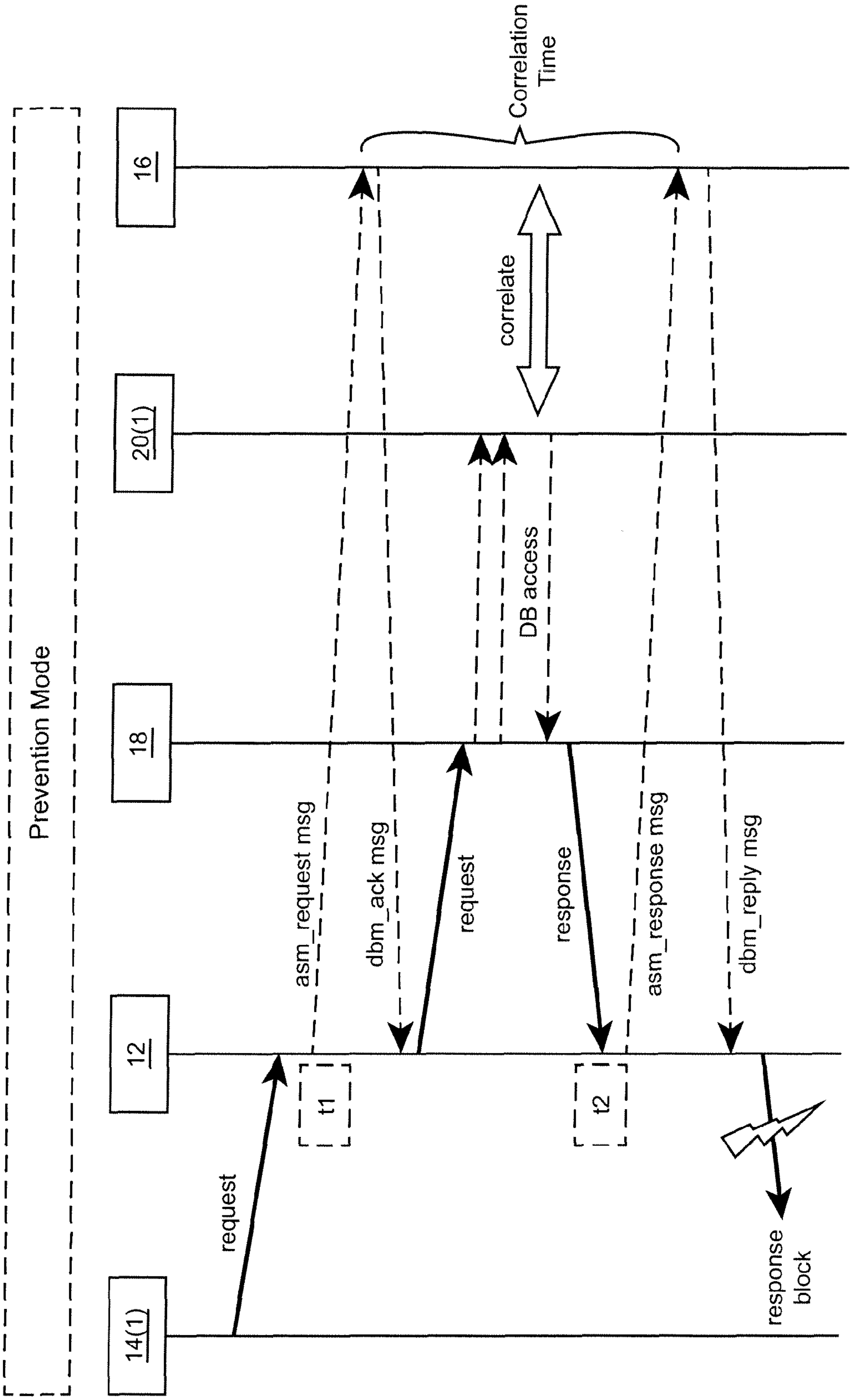
Prevention Mode
14(1)
12
18
20(1)
16
Correlation Time
correlate
DB access
request
t1
asm_request msg
dbm_ack msg
request
response
t2
asm_response msg
dbm_reply msg
response block

FIG. 5

METHODS FOR IDENTIFYING NETWORK TRAFFIC CHARACTERISTICS TO CORRELATE AND MANAGE ONE OR MORE SUBSEQUENT FLOWS AND DEVICES THEREOF

FIELD

This technology relates to methods for identifying network traffic characteristics to correlate and manage one or more subsequent flows and devices thereof.

BACKGROUND

As enterprise customers deploy more web-based database applications, IT administrators face several challenges for correlating and managing subsequent flows. For example, IT administrators would like to provide a data access audit trail which is not always possible. Additionally, IT administrators would like to be able to monitor and effectively alert or terminate a user session deemed to be misbehaving based on a data or other access policy. Further, IT administrators would like to secure both application and database environments from threats, such as SQL injection and cross-site scripting attacks.

SUMMARY

A method for identifying network traffic characteristics to correlate and manage one or more subsequent flows includes transmitting, by a traffic management computing device, a monitoring request comprising one or more attributes extracted from an HTTP request received from a client computing device and a timestamp to a monitoring server to correlate one or more subsequent flows associated with the HTTP request. The HTTP request is transmitted, by the traffic management computing device, to an application server after receiving an acknowledgement response to the monitoring request from the monitoring server. An HTTP response to the HTTP request is received, by the traffic management computing device, from the application server. An operation with respect to the HTTP response is performed, by the traffic management computing device, after transmitting a monitoring response message to end the correlation associated with the HTTP request in response to the monitoring request.

A non-transitory computer readable medium having stored thereon instructions for identifying network traffic characteristics to correlate and manage one or more subsequent flows comprising machine executable code which when executed by at least one processor, causes the processor to perform steps including transmitting a monitoring request comprising one or more attributes extracted from an HTTP request received from a client computing device and a timestamp to a monitoring server to correlate one or more subsequent flows associated with the HTTP request. The HTTP request is transmitted to an application server after receiving an acknowledgement response to the monitoring request from the monitoring server. An HTTP response to the HTTP request is received from the application server. An operation with respect to the HTTP response is performed.

A traffic management computing device includes a memory coupled to one or more processors which are configured to execute programmed instructions stored in the memory including transmitting a monitoring request comprising one or more attributes extracted from an HTTP request received from a client computing device and a timestamp to a monitoring server to correlate one or more subsequent flows associated with the HTTP request. The HTTP request is transmitted to an application server after receiving an acknowledgement response to the monitoring request from the monitoring server. An HTTP response to the HTTP request is received from the application server. An operation with respect to the HTTP response is performed

This technology provides a number of advantages including providing effective methods, non-transitory computer readable medium, and devices that identify network traffic characteristics to correlate and manage one or more subsequent flows. With this technology, access audit trails can be generated that are granular at the data level and also tie in attributes from the web application layer. Additionally, this technology can monitor and effectively alert or terminate a user session deemed to be misbehaving based on a data access policy. Further, this technology helps to secure both application and database environments from threats, such as SQL injection and cross-site scripting attacks.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is an environment with an exemplary traffic management computing device that identifies network traffic characteristics to correlate and manage one or more subsequent flows;

FIGS. **2** and **3** are flow and functional diagrams of a method for identifying network traffic characteristics to correlate and monitor one or more subsequent flows to generate an audit trail; and

FIGS. **4** and **5** are flow and functional diagrams of a method for identifying network traffic characteristics to correlate and manage access to one or more subsequent flows.

DETAILED DESCRIPTION

An environment **10** with an exemplary traffic management computing device that identifies network traffic characteristics to correlate and manage one or more subsequent flows is illustrated in FIG. **1**. The environment **10** includes a traffic management computing device **12**, a plurality of client computing devices **14**(**1**)-**14**(n), a database monitoring server **16**, a web application server **18**, and data servers **20**(**1**)-**20**(n) which are all coupled together by one or more communication networks **21**(**1**)-**21**(**4**), although this environment can include other numbers and types of systems, devices, components, and elements in other configurations. This technology provides a number of advantages including providing effective methods, non-transitory computer readable medium, and devices that identify network traffic characteristics to correlate and manage one or more subsequent flows, such as request and/or response flows.

The traffic management computing device **12** provides a number of functions as illustrated and described with the examples herein including identifying network traffic characteristics to correlate and manage one or more subsequent flows, although other numbers and types of systems can be used and other numbers and types of functions can be performed. In this example, the traffic management computing device **12** includes a central processing unit (CPU) or processor **22**, a memory **24**, and an interface system **26** which are coupled together by a bus or other link, although other numbers and types of systems, devices, components, and elements in other configurations production data storage device **16**, and a backup data storage device **18** and locations can be used. The processor **22** executes a program of stored instructions for one or more aspects of the present technology as described and illustrated by way of the examples herein, although other types and numbers of processing devices and logic could be used and the processor **22** could execute other numbers and types of programmed instructions.

The memory **24** stores these programmed instructions for one or more aspects of the present technology as described and illustrated herein, although some or all of the programmed instructions could be stored and executed elsewhere. A variety of different types of memory storage devices, such as a random access memory (RAM) or a read only memory (ROM) in the system or a floppy disk, hard disk, CD ROM, DVD ROM, or other computer readable medium which is read from and written to by a magnetic, optical, or other reading and writing system that is coupled to the processor **22**, can be used for the memory **24**.

In this example, the interface system **26** in the traffic management computing device **12** is used to operatively couple and communicate between the traffic management computing device **12** and the plurality of client computing devices **14**(**1**)-**14**(n), the database monitoring server **16**, and the web application server **18**, which are all coupled together by one or more communication networks **21**(**1**), **21**(**2**), and **21**(**4**), although other types and numbers of communication networks or systems with other types and numbers of connections and configurations to other devices and elements, such as communication network **21**(**3**) to communicate with data servers **20**(**1**)-**20**(n) could be used. In this illustrative example, application, web application server **18** is coupled to data servers **20**(**1**)-**20**(n) via communication network **20**(**3**). Additionally, by way of example only, the one or more the communications networks can use TCP/IP over Ethernet and industry-standard protocols, including NFS, CIFS, SOAP, XML, LDAP, and SNMP, although other types and numbers of communication networks, such as a direct connection, a local area network, a wide area network, modems and phone lines, e-mail, and wireless communication technology, each having their own communications protocols, can be used. In the exemplary environment **10** shown in FIG. **1**, three communication networks **21**(**1**)-**21**(**4**) are illustrated, although other numbers and types could be used.

The client computing devices **14**(**1**)-**14**(n), the database monitoring server **16**, the web application server **18**, and the data servers **20**(**1**)-**20**(n) each may include a central processing unit (CPU) or processor, a memory, and an interface or I/O system, which are coupled together by a bus or other link, although each could comprise other numbers and types of elements and components, such as configured control logic to execute one or more aspects of this technology. Each of the client computing devices **14**(**1**)-**14**(n) may submit an HTTP request for data or operations from the web application server **18** through the traffic management computing device **12** and may receive HTTP responses, although other numbers and types of requests and responses can be transmitted and received and other types and numbers of functions could be performed.

The database monitoring server **16** may interact with the traffic management device **12** to receive one or more attributes extracted from the HTTP request along with a timestamp and may use the attributes and timestamp to correlate one or more subsequent flows associated with the HTTP request to one or more of the data servers **20**(**1**)-**20**(n), although other numbers and types of functions can be performed.

The web application server **18** may receive and process the one or more HTTP requests or other requests from one or more of the client computing devices **14**(**1**)-**14**(n) to execute one or more SQL queries or requests to obtain responsive data or other information from one or more of the data servers **20**(**1**)-**20**(n), although other numbers and types of functions can be performed. Each of the data servers **20**(**1**)-**20**(n) store content, such as files and directories, in relational databases and perform other operations, although other numbers and types of servers or other computing device which could have other numbers and types of functions and/or store other data could be used.

Although an example of the traffic management computing device **12**, the plurality of client computing devices **14**(**1**)-**14**(n), the database monitoring server **16**, the web application server **18**, and the data servers **20**(**1**)-**20**(n) are described herein, other types and numbers of devices could be used and each of these devices could be implemented in other configurations and manners on one or more of any suitable computer system or computing device. It is to be understood that the devices and systems of the examples described herein are for exemplary purposes, as many variations of the specific hardware and software used to implement the examples are possible, as will be appreciated by those skilled in the relevant art(s).

Furthermore, each of the systems of the examples may be conveniently implemented using one or more general purpose computer systems, microprocessors, digital signal processors, and micro-controllers, programmed according to the teachings of the examples, as described and illustrated herein, and as will be appreciated by those ordinary skill in the art.

In addition, two or more computing systems or devices can be substituted for any one of the systems in any embodiment of the examples. Accordingly, principles and advantages of distributed processing, such as redundancy and replication also can be implemented, as desired, to increase the robustness and performance of the devices and systems of the examples. The examples may also be implemented on computer system or systems that extend across any suitable network using any suitable interface mechanisms and communications technologies, including by way of example only telecommunications in any suitable form (e.g., voice and modem), wireless communications media, wireless communications networks, cellular communications networks, G3 communications networks, Public Switched Telephone Network (PSTNs), Packet Data Networks (PDNs), the Internet, intranets, and combinations thereof.

The examples may also be embodied as a non-transitory computer readable medium having instructions stored thereon for one or more aspects of the present technology as described and illustrated by way of the examples herein, as described herein, which when executed by a processor, cause the processor to carry out the steps necessary to implement the methods of the examples, as described and illustrated herein.

An exemplary method for identifying network traffic characteristics to correlate and monitor one or more subsequent flows to generate an audit trail will now be described with reference to FIGS. **1**-**3**. In step **100**, the traffic management computing device **12** monitors for when one of the client computing devices **14**(**1**)-**14**(n) performs a login request and submits a login form containing username or other login identifier, although other manners for monitoring a login, such as the traffic management computing device **12** providing an initial login page, could be used.

In step **102**, the traffic management computing device **12** determines whether a received user request, such as an HTTP request by way of example only, with a username or other login credentials can be associated with one of the client computing devices **14**(**1**)-**14**(n), although other types of requests from other types of devices could be received. If in step **102**, the traffic management computing device **12** can not associate the received user request with the username or other login credentials with one of the client computing devices **14**(**1**)-**14**(n), then the No branch is taken to step **104**.

In step **104**, the traffic management computing device **12** determines whether this exemplary method should end, such as when the user at the one of the client computing devices **14**(**1**)-**14**(n) logs out or stops browsing by way of example only, although other manners for determining when this method should end can be used. If in step **104** the traffic management computing device **12** determines this exemplary method should end, then the Yes branch is taken to step **106** where this exemplary method ends. If in step **104** the traffic management computing device **12** determines this exemplary method should not end, then the No branch is taken back to step **102** as described earlier.

If back in step **102**, the traffic management computing device **12** can associate a received user request with a username or other login credentials with one of the client computing devices **14**(**1**)-**14**(n), then the Yes branch is taken to step **108**. For illustration purposes in FIG. **3** for this particular example, the user request is provided by the client computing device **14**(**1**), although other types of devices could provide the request.

In step **108**, the traffic management computing device **12** extracts a client identification, such as one or more of a login username, IP address, authentication credentials, and an authentication cookie value by way of example only, a session identification, and one or more values from the received user request, although other types and amounts of data can be extracted.

In step **110**, the traffic management computing device **12** generates a monitoring request message, shown by way of example only as "asm_request.msg" in FIG. **3**. The generated monitoring request message includes a timestamp and the extracted client identification, session identification, and one or more values from the received user request, although other types of messages with other data may be generated. In step **112**, the traffic management computing device **12** transmits the generated monitoring request to the database monitoring server **16** over an unencrypted TCP socket over a secure internal LAN provided by communication network **21**(**2**), although other manners of transmitting this message over other types of connections and networks can be used. Once the monitoring request has been received by the database monitoring server **16**, the database monitoring server **16** generates and transmits a monitoring acknowledgement response to the traffic management computing device **12**.

In step **114**, the traffic management computing device **12** receives the monitoring acknowledgement response, shown by way of example only as "dbm_ack.msg" in FIG. **3**, from the database monitoring server **16**.

In step **116**, the traffic management computing device transmits the received user request to the application server **18**. The application server **18** receives the user request forwarded from the traffic management computing device **12** and may issue one or more SQL requests for data or other operations from one or more of the data servers **20**(**1**)-**20**(n), although other types and numbers of requests, such as an XML query, XPATH, or an WS security request by way of example only, to other types and numbers of devices could be used. For illustration purposes in FIG. **3** for this particular example, the SQL requests from the application server **18** are provided to the data server **20**(**1**), although the requests could be transmitted to other devices to obtain the requested data.

In step **118**, with the information in the generated monitoring request, the database monitoring server **16** is now able to monitor and correlate data flows between the application server **18** and one or more of the data servers **20**(**1**)-**20**(n) which are associated with the received user request, although types of flows of requests and/or responses to other types of servers and computing devices could be monitored and correlated. The database monitoring server **16** also may apply one or more stored access or other policies to the data flows between the application server **18** and one or more of the data servers **20**(**1**)-**20**(n), although the access or other policies could be applied to other types of flows to other types of servers and computing devices. Additionally, the database monitoring server **16** is able to generate an audit trail associate with the user request and the correlated SQL or other requests.

In step **120**, the traffic management computing device **12** determines whether a response to the user request has been received. If in step **120**, the traffic management computing device **12** determines a response to the user request has not been received, then the No branch is taken back to step **118** as described earlier and then database monitoring server **16** continues to monitor and correlate data flows between the application server **18** and one or more of the data servers **20**(**1**)-**20**(n). If in step **120**, the traffic management computing device **12** determines a response to the user request has been received, then the Yes branch is taken back to step **122**.

In step **122**, the traffic management computing device **12** generates and transmits a monitoring response message, shown by way of example only as "asm_response.msg" in FIG. **3**, to the database monitoring server **16**. When the database monitoring server **16** receives the monitoring response message it stops any further monitoring and correlation of data flows between the application server **18** and one or more of the data servers **20**(**1**)-**20**(n) for the previously received user request. In step **124**, the traffic management computing device **12** transmits the user response received from the application server **18** to the requesting one of the client computing devices **14**(**1**)-**14**(n) which is shown by way of example only in FIG. **3** as client computing device **14**(**1**) and then proceeds to step **104** as described earlier.

An exemplary method for identifying network traffic characteristics to correlate and manage access to one or more subsequent flows will now be described with reference to FIGS. **1**, **4** and **5**. This exemplary method is the same as the exemplary method described with reference to FIGS. **1**-**3**, except as illustrated and described herein. Steps in the exemplary method described with reference to FIGS. **1**, **4**, and **5** which are like those in the exemplary method described earlier with reference to FIGS. **1**-**3**, will have like reference numerals and will not be described again.

In step **122**, the traffic management computing device **12** generates and transmits a monitoring response message, shown by way of example only as asm_response. msg" in FIG. **3**, to the database monitoring server **16**. However, in this exemplary method the traffic management computing device **12** now waits for a subsequent action message from the database monitoring server **16** before determining what action to take with respect to the HTTP response to the received user request from one of the client computing devices **14**(**1**)-**14**(n), which is shown by way of example only in FIG. **5** as client computing device **14**(**1**). The database monitoring server **16** can monitor the data flows between the application server **18** and one or more of the data servers **20**(**1**)-**20**(n) and generate one or more commands. In this example, the received action can comprise allowing this HTTP response to be transmitted to the requesting one of the client computing devices **14**(**1**)-**14**(n), logging this HTTP response for auditing or other purposes in a memory storage device, reporting this HTTP response to one or more designated entities, quarantining or otherwise blocking this HTTP response from being transmitted to the requesting one of the client computing devices **14**(**1**)-**14**(n), if for example an SQL injection is detected, and terminating this HTTP response, although other types and numbers of operations based on a received command can be executed. The blocking may be at the web-application level, at the level of the transaction, or later for the user or user session and the commands may be based on the data access policy comprising one or more SQL injection policies in the database monitoring server **16**.

In step **126**, the traffic management computing device **12** determines whether an action message, shown by way of example only as "dbm_reply.msg" in FIG. **5**, from the database monitoring server **16** has been received. If in step **126**, the traffic management computing device **12** determines an action message from the database monitoring server **16** has not been received, then the No branch is taken back to the start of step **126**, although other options are available, such as ending this method after a set period of time if a command message is not received. If in step **126**, the traffic management computing device **12** determines an action message from the database monitoring server **16** has been received, then the Yes branch is taken to step **128**.

In step **128**, the traffic management computing device **12** executes the specified action in the message with respect to the HTTP response to the received user request, although other types and numbers of operations can be performed. As noted earlier, these actions can, by way of example only, include allowing, logging, reporting, quarantining, or terminating the response to the received user request. Once the traffic management computing device **12** has completed the action with respect to the HTTP response based on the received command, this exemplary method returns to step **104** as described earlier.

Accordingly, as illustrated and described in the exemplary methods herein, this technology provides effective methods, non-transitory computer readable medium, and devices that identify network traffic characteristics to correlate and manage one or more subsequent flows. With this technology, data access audit trails can be generated that are granular at the data level and also tie in attributes from the web application layer. Additionally, this technology can monitor and effectively alert or terminate a user session deemed to be misbehaving based on a data access policy. Further, this technology helps to secure both application and database environments from threats, such as SQL injection and cross-site scripting attacks.

Having thus described the basic concept of the invention, it will be rather apparent to those skilled in the art that the foregoing detailed disclosure is intended to be presented by way of example only, and is not limiting. Various alterations, improvements, and modifications will occur and are intended to those skilled in the art, though not expressly stated herein. These alterations, improvements, and modifications are intended to be suggested hereby, and are within the spirit and scope of the invention. Additionally, the recited order of processing elements or sequences, or the use of numbers, letters, or other designations therefore, is not intended to limit the claimed processes to any order except as may be specified in the claims. Accordingly, the invention is limited only by the following claims and equivalents thereto.

What is claimed is:

1. A method for identifying network traffic characteristics to correlate and manage one or more subsequent flows executable by one or more traffic management devices with at least one processor for executing the method, the method comprising:

transmitting, by a processor on the one or more traffic management devices, a monitoring request comprising one or more attributes extracted from an HTTP request received from a client computing device and a timestamp to a monitoring server to correlate one or more subsequent flows associated with the HTTP request;

transmitting, by the processor on the one or more traffic management devices, the HTTP request to an application server after receiving an acknowledgement response to the monitoring request from the monitoring server;

receiving, by the processor on the one or more traffic management devices, an HTTP response to the HTTP request from the application server;

transmitting, by the processor on the one or more traffic management devices, a monitoring response message to end the correlation associated with the HTTP request; and

performing, by the processor on the one or more traffic management devices, at least one operation with respect to the HTTP response when a command message in a response to the monitoring response message is not received before a predetermined period of time elapses.

2. The method of claim **1** wherein the performing further comprises:

outputting, by the processor on the one or more traffic management devices, the HTTP response to the requesting client computing device.

3. The method of claim **1** further comprising:

receiving, by the processor on the one or more traffic management devices, a determined action with respect to the HTTP request from the monitoring server which is based on at least one data access policy, wherein the performing further comprises executing, by the traffic management computing device, the determined action on the HTTP response.

4. The method of claim **3** wherein the determined action comprises one or more of allowing, logging, reporting, quarantining, and terminating, by the traffic management computing device, the output of the HTTP response to the requesting client computing device.

5. The method of claim **1** wherein the one or more attributes comprise a client identification and a session identification in the HTTP request.

6. The method of claim **5** wherein the one or more attributes further comprise one or more request values.

7. A non-transitory computer readable medium having stored thereon instructions for identifying network traffic characteristics to correlate and manage one or more subsequent flows comprising machine executable code which when executed by at least one processor, causes the processor to perform steps comprising:

transmitting a monitoring request comprising one or more attributes extracted from an HTTP request received from a client computing device and a timestamp to a monitoring server to correlate one or more subsequent flows associated with the HTTP request;

transmitting the HTTP request to an application server after receiving an acknowledgement response to the monitoring request from the monitoring server;

receiving an HTTP response to the HTTP request from the application server;

transmitting a monitoring response message to end the correlation associated with the HTTP request; and

performing at least one operation with respect to the HTTP response when a command message in a response to the monitoring response message is not received before a predetermined period of time elapses.

8. The medium of claim **7** wherein the performing further comprises outputting the HTTP response to the requesting client computing device.

9. The medium of claim **7** further comprising receiving a determined action with respect to the HTTP request from the monitoring server which is based on at least one data access policy, wherein the performing further comprises executing the determined action on the HTTP response.

10. The medium of claim **9** wherein the determined action comprises one or more of allowing, logging, reporting, quarantining, and terminating the output of the HTTP response to the requesting client computing device.

11. The medium of claim **7** wherein the one or more attributes comprise a client identification and a session identification in the HTTP request.

12. The medium of claim **11** wherein the one or more attributes further comprise one or more request values.

13. One or more traffic management computing devices comprising:

one or more processors;

a memory coupled to the one or more processors which are configured to be capable of executing programmed instructions, which comprise the programmed instructions stored in the memory to:

transmit a monitoring request comprising one or more attributes extracted from an HTTP request received from a client computing device and a timestamp to a monitoring server to correlate one or more subsequent flows associated with the HTTP request;

transmit the HTTP request to an application server after receiving an acknowledgement response to the monitoring request from the monitoring server;

receive an HTTP response to the HTTP request from the application server;

transmit a monitoring response message to end the correlation associated with the HTTP request; and

perform at least on operation with respect to the HTTP response when a command message in response to the monitoring response message is not received before a predetermined period of time elapses.

14. The device of claim **13** wherein the performing further comprises outputting the HTTP response to the requesting client computing device.

15. The device of claim **13** wherein the one or more processors is further configured to execute programmed instructions stored in the memory further comprising receiving a determined action with respect to the HTTP request from the monitoring server which is based on at least one data access policy, wherein the performing further comprises executing the determined action on the HTTP response.

16. The device of claim **15** wherein the determined action comprises one or more of allowing, logging, reporting, quarantining, or terminating the output of the HTTP response to the requesting client computing device.

17. The device of claim **13** wherein the one or more attributes comprise a client identification and a session identification in the HTTP request.

18. The device of claim **17** wherein the one or more attributes further comprise one or more request values.

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